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BHOPAL GAS DISASTER: HISTORY AND LESSONS

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БХОПАЛЬСЬКА ГАЗОВА КАТАСТРОФА: ІСТОРІЯ ТА УРОКИ

The Bhopal gas tragedy, which is regarded as the world's worst industrial disaster, occurred on 3rd December 1984, in the city of Bhopal, Madhya Pradesh state, India. This disaster resulted from the release of toxic chemical Methyl Isocyanate (MIC) from the pesticide plant of Union Carbide India Limited (UCIL). The gas drifted over the densely populated neighbourhoods around the plant, killing thousands of people immediately and creating a panic as tens of thousands of others attempted to flee Bhopal. The final death toll was estimated to be between 15,000 to 20,000 and nearly 50,000 people were permanently disabled [1, p. 122].

Many causal factors brought about this disaster, but investigators focused on a human error. The absence of proper safety systems and the general staff negligence at UCIL contributed greatly to the disastrous effects of the Bhopal gas leak. Many previous warnings and similar incidents from the plant were ignored by the UCIL management. As many as six accidents had occurred at the plant before the major catastrophe. Moreover, the Indian Labour Department had previously ordered for changes at the plant, none of which were taken into consideration to improve plant safety.

What exactly happened on ill-fated night of 2 December 1984 is still not very clear [2]. But by summing up the sequence of events, the most postulated theory narrates that MIC was stored in three double-walled, partly buried stainless steel tanks having code numbers E610, E611, and E619. During the change of shift around 10.45 pm to 11.00 pm, one of the employees of fresh shift noticed that the pressure of the tank E610 has risen to 10 psi, which was fivefold of the pressure recorded by his predecessor [3, p. 3-4].

This sudden increase in pressure was dismissed and considered faulty pressure recording instrument. Around 11.30 pm, some of the workers noticed burning sensation and tears in their eyes, few of them noticed a drip of liquid along with some yellowish-white gas coming out of MIC structure. It was reported to Supervisor on duty, who decided to deal with the leakage after the scheduled tea-break at 12.15 am. In next 15-20 minutes, when the tea break ended, the situation was even worse; the pressure in the Tank E610 was indicating its maximum reading of 55 psi. Control room operator checked gauges on tank and found that the safety valve popped, tank was rumbling, and heat was emanating from the tank. There was no sign of flow of caustic soda and a cloud of gas was found escaping from the scrubber stack. By 12.40 am, the plant supervisor suspended operations of the MIC plant and turned on the in-plant and external toxic gas sirens. The fire water sprayers were used but water could not reach the gas cloud, which was forming at the top of the scrubber stack. Due to failure of refrigeration system, efforts to cool the Tank E610 also failed. Thus, the escape of MIC gas could not be stopped and it continued for almost 2 hours [3, p. 4].

By 7.00 am 70 people were dead, by 9.00 am 260 were dead and thereafter the figures continued to rise. Though not all dead bodies were brought to the Medico-Legal (MLI), 311

bodies were received on 3 December 1984, when residents awoke to clouds of suffocating gas and began a desperate flight through the dark streets. No alarm ever sounded a warning and no evacuation plan was prepared. When victims arrived at hospitals breathless and blind, doctors did not know how to treat them since Carbide had not provided emergency information. But it was only when the sun rose the next morning that the magnitude of the devastation was clear. Dead bodies of humans and animals blocked the streets, leaves turned black, and the smell of burning chilli peppers lingered in the air. Responsible estimates suggest that as many as 10,000 may have died immediately. The MLI continued to perform autopsies on gas-affected victims in subsequent years [2, p. 905].

Basically, the Bhopal disaster was a result of many legal, technological, organizational, and human errors all which contributed to cause this industrial disaster. Before the disaster, many prior warnings and accidents related to methyl isocyanate had occurred in the industry, but none received the massive media attention Bhopal did.

The Bhopal tragedy was a long overdue wake up call to the chemical industry, a tragedy of such magnitude has changed the chemical industry for the better; many lessons were learned from Bhopal which helped raise safety awareness within the chemical industry. Many companies and universities started incorporating process safety into its training curriculum, the United States formed the Chemical Safety board in an attempt to use the lessons learned from such Bhopal and invoke positive change within the industry to prevent future incidents and save lives [4, p. 28].

Some of the major lessons from this disaster for safety in the Chemical Industry are:

- Bhopal invoked worldwide and intense publicity for a long time. This helped bring chemical process safety to the forefront, both within the chemical industry and to the general public who started perceiving it as unsafe and risky.
- Major hazard installations were taken lightly before the incident, had the plant been located in a less densely populated area, such a tragedy could have been averted.
- It has established that a safety valve should only open when the pressure rise inside the vessel threatens its integrity but not with any minor pressure deviation.
- Under no circumstances shall any safety devices be disabled in a plant; it is crucial to have strict procedures for disabling any safety equipment and to try to keep it to minimum.
- Regular and effective maintenance is crucial in any plant setting, and immediate action should be taken when anything unusual is detected [4].

In summary, the Bhopal tragedy sent shockwaves throughout the chemical industry, provoking wide scale changes and highlighting process safety as a crucial and indispensable element at both the technical and managerial levels. Since then, there has been significant progress in the development of safety and health at work, which is giving rise to the corporate social responsibility initiatives that are operating in recent times, such as Responsible Care, a voluntary global initiative for the chemical industry under which companies work to continuously improve their performance in safety, health and the environment. Disasters like Bhopal or the Chernobyl nuclear accident in 1986, were incidents that tragically started to concoct the current concept of the safety culture. Surely, the lives that those accidents took helped create a new safety culture that has saved the lives of many other people from disaster.

The main conclusion that can be drawn is that development is the necessity of human race and it is always wiser to learn lessons from accidents rather stopping the development activities. Any disaster gives strong lesson to the mankind - "IT SHOULD NOT REPEAT AGAIN."

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THE CHORNOBYL DISASTER IN THE CULTURAL AND HISTORICAL DISCOURSE

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ЧОРНОБИЛЬСЬКА КАТАСТРОФА У КУЛЬТУРНО-ІСТОРИЧНОМУ ДИСКУРСІ

The Chernobyl disaster is a tragic event that impressed everyone with its scale, caused international resonance and was reflected in various forms of cultural reproduction which prompted a new understanding of the world as well as became a «generator» of historical experience and «living memory» of the Ukrainian nation. The Chernobyl Exclusion Zone can be considered a place of the technological, socio-cultural and political crisis. The zone arose rather as a result of that crisis - it is a symbol of the dead political system and utopian Soviet ideals.

In Western literature the expression «cultural Chernobyl» which distinguishes the constituent basis of «spiritual extinction» is often used in relation to the mental and spiritual crisis of the post-Soviet society. In fact, after the collapse of the USSR, Ukraine, rising on the ruins of the Chernobyl nuclear power plant, was held hostage to the disaster and it became a mnemonic place of rethinking of the post-Soviet life in general by gradually becoming a transit meeting place for West and East. Such a situation encouraged citizens to live in the parameters of constant responsibility and memory of the past. Consequently, the reflexive cultural representation of the Chernobyl accident also determined the general state of Ukraine's spiritual crisis [1, p. 96].

The uniqueness of historical and cultural experience gained by the Ukrainians during the liquidation period as well as ethnosophical features of the regional thinking, gave the possibility of the fruitful, intensive development of cultural and artistic reflections on the events and consequences of the 1986 accident: in extreme conditions, people fought with two invisible forces - radiation and information about it.

With the acquisition of political independence, since the beginning of the 90s of the twentieth century, Ukraine has begun to experience a process of «renaissance» of understanding and interpreting of many events in its history, by forming a «national history». Thus, with the gradual declassification of a large layer of material from the archives of the totalitarian USSR - new historical facts have appeared, the interpretation of well-known events has changed, a new understanding of the past has appeared which was not publicly mentioned before. The Chernobyl disaster belongs to such «historical revelation».

The total study of the potential of post-Soviet transformations is promoted with the help of the modern culturological thought. The Chernobyl tourism, with the typical classical infrastructure of such towns as Chernobyl and Pripyat, falls into the category of such searches, as the very communist symbols and industrial «Soviet» urban planning are a priority